Collision between the *Riley Elizabeth* Tow and US Army Corps of Engineers Barge Plant Mississippi River near Waterproof, Louisiana July 18, 2014

Marine Accident Report

NTSB/MAR-15/03
PB2016-101374

National Transportation Safety Board

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National
Transportation
Safety Board

490 L'Enfant Plaza, SW
Washington, DC 20594

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Abstract: This report discusses the July 18, 2014, accident in which a downbound tow on the Mississippi River collided with a revetment project barge plant. No one was injured in the accident; however, the damage totaled about $300,000.

The report identifies the following safety issues: incomplete information to mariners about waterway obstructions, and the need for expanded use of automatic identification system features to mark waterway obstructions.

As a result of this investigation, the National Transportation Safety Board makes new safety recommendations to the US Army Corps of Engineers.

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Acronyms and Abbreviations

AIS	automatic identification system
CFR	*Code of Federal Regulations*
COTP	captain of the port (Coast Guard)
ECS	electronic chart system
NTSB	National Transportation Safety Board
USC	*United States Code*
VHF	very high frequency

Executive Summary

On July 18, 2014, about 0355 central daylight time, the towing vessel *Riley Elizabeth* was pushing 30 barges on the Mississippi River at Kempe Bend, near Waterproof, Louisiana, when the vessel and two of its barges collided with a US Army Corps of Engineers (Corps of Engineers) barge plant conducting a revetment project. No one was injured in the accident; however, the collision resulted in an estimated $100,000 in damage to the *Riley Elizabeth* and two of its barges and $200,000 in damage to the barge plant.

The National Transportation Safety Board determines that the probable cause of the collision of the *Riley Elizabeth* tow with the Corps of Engineers barge plant was the incomplete information provided by the Corps of Engineers about the extent of the obstruction in the waterway, and the failure of the *Riley Elizabeth* mate to determine the extent of the obstruction before starting the turn at Kempe Bend.

Safety issues identified in this accident include the following:

- **Incomplete information to mariners about waterway obstructions:** Neither the Corps of Engineers contact vessels that were positioned near the barge plant nor the public information that the Corps of Engineers disseminated about the barge plant specified the extent of the waterway obstruction.

- **Need for expanded use of automatic identification system (AIS) features to mark waterway obstructions:** The Corps of Engineers barges did not display electronically on AIS receivers or vessel charting software to inform mariners about the extent of the waterway obstruction posed by the barge plant.

As a result of this investigation, the National Transportation Safety Board makes new recommendations to the Corps of Engineers.

1. The Accident

On July 16, 2014, at 1415 central daylight time, the 128-foot-long towing vessel *Riley Elizabeth* (figure 1) departed Helena, Arkansas, on the Mississippi River, bound for Natchez, Mississippi, about 300 statute miles downriver (figure 2).[1]

Figure 1. Postaccident photo of the *Riley Elizabeth* on the Mississippi River. (Photo by Western Rivers Boat Management)

The *Riley Elizabeth* was pushing 30 barges loaded with corn, beans, rice, and sand. The barges were arranged six across (widthwise side by side) and five deep (lengthwise one after the other; figures 3 and 4). Each barge was 200 feet long and 35 feet wide. The entire tow (vessel and barges) was 1,128 feet long and 210 feet wide.

[1] Unless otherwise noted, all times in this report are central daylight time (coordinated universal time – 5 hours) based on the 24-hour clock.

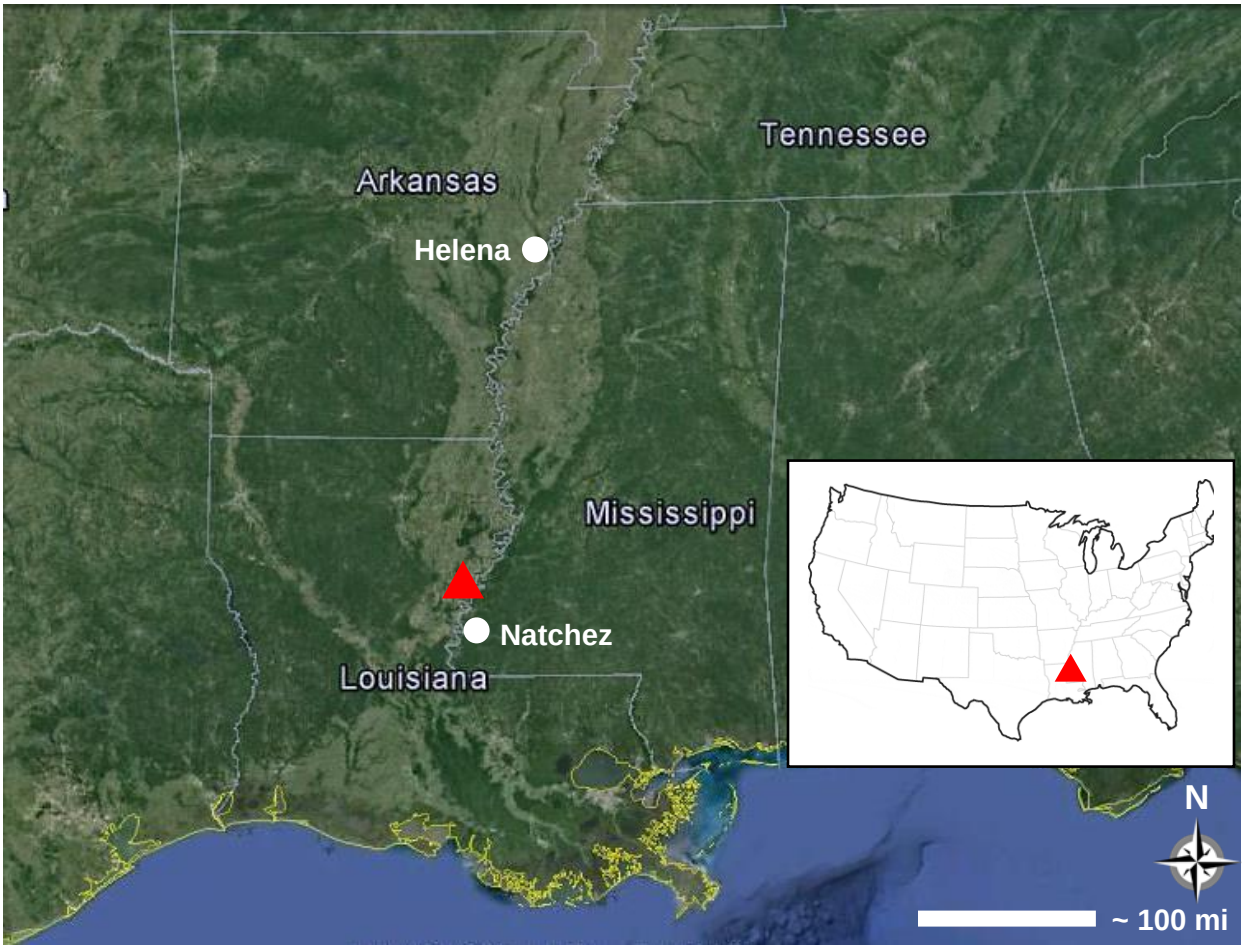

Figure 2. Satellite image of the accident area. When the collision occurred, the *Riley Elizabeth* tow was transiting downriver on the Mississippi River (which can be seen meandering along the border between the states of Arkansas, Tennessee, Mississippi, and Louisiana). The accident site is marked by a red triangle. (Background by Google Earth)

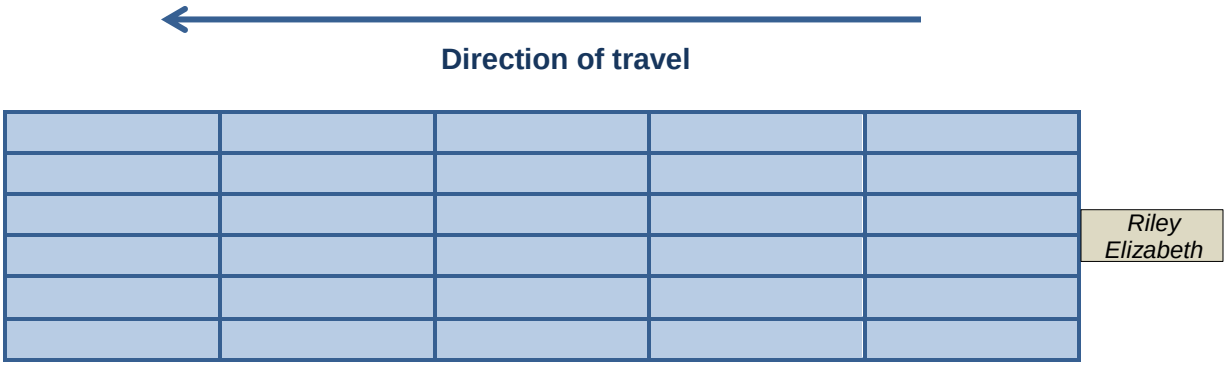

Figure 3. Graphic (not to scale) illustrating the barge arrangement in the *Riley Elizabeth* tow.

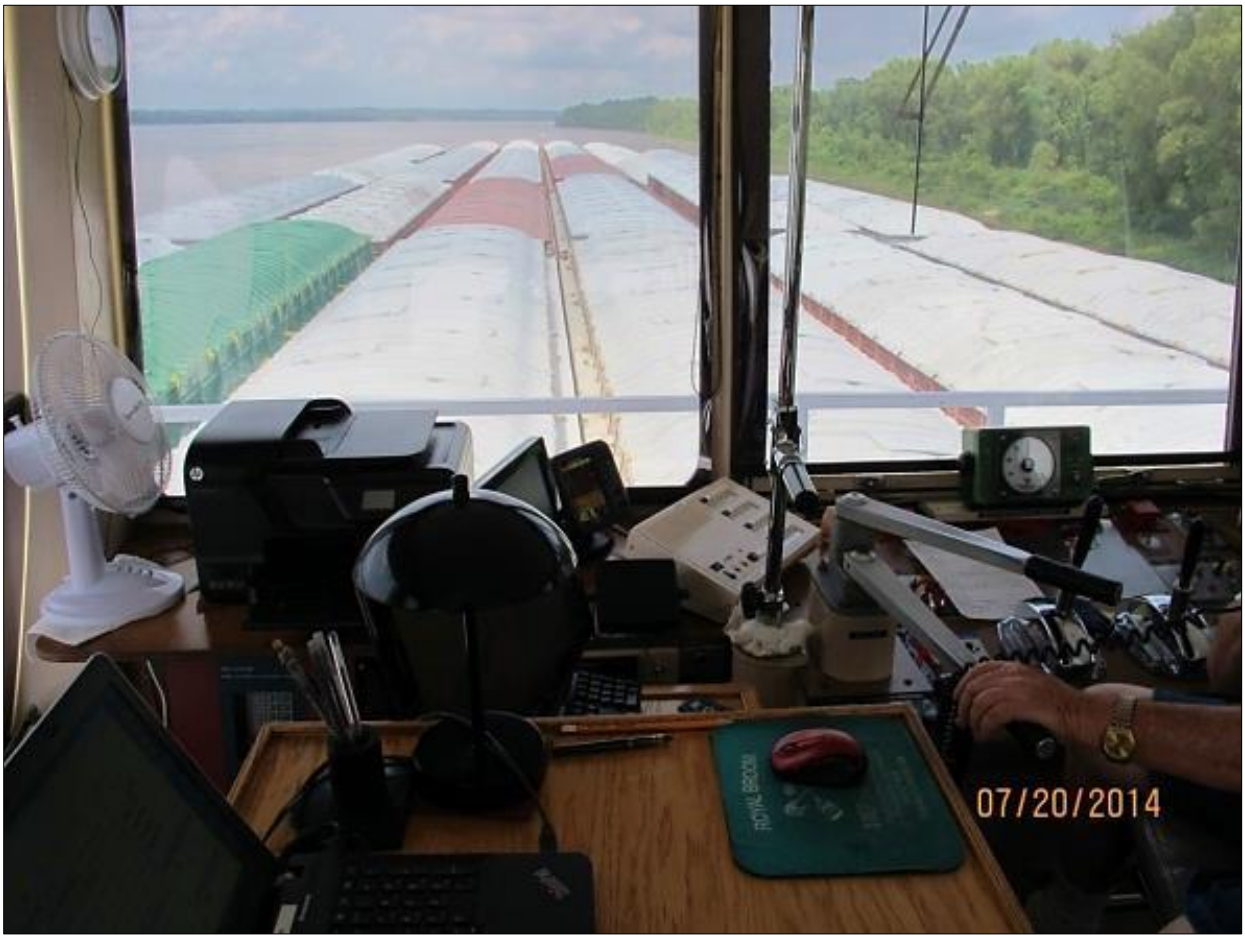

Figure 4. Photo from inside the *Riley Elizabeth*'s wheelhouse, taken 2 days after the accident, showing a similar towing arrangement to that at the time of the collision. In this photo, the vessel has 28 covered hopper barges under tow; at the time of the accident, the vessel was pushing 30 barges.

Eight crewmembers were on board the *Riley Elizabeth*. Two of them—the captain and the mate—were credentialed masters.[2] Four deckhands and two senior deckhands were also on board. The captain and the mate alternated having the conn, or navigational control of the vessel, every 6 hours. The captain had the conn during the 0600 to noon and the 1800 to midnight watches, and the mate had the conn during the midnight to 0600 and the 1200 to 1800 watches. (Also see section "1.2 Personnel Information.")

At midnight on July 18, the mate took the conn as scheduled. He told investigators that, during the nighttime transit, he used the vessel's electronic chart system (ECS) and radar to navigate the dark waterway. He said he also used the vessel's two searchlights "all morning long" to locate buoys and check the shoreline, verifying that the ECS display matched the river topography. Leading up to the collision, he was alone in the wheelhouse.

Shortly before 0300, the mate was on the very high frequency (VHF) radio discussing meeting arrangements with two upbound tows, which he later transited past without incident. About this point in the voyage, the *Riley Elizabeth* tow was approaching a nearly 90-degree left turn in the river, known as Kempe Bend (figure 5), near the town of Waterproof, Louisiana. The

[2] A "mate" in this capacity is also termed "pilot" on inland/western river waterways. This report uses the term "mate."

mate had operated tows through Kempe Bend before; however, he told investigators that he wanted to know how other downbound tows had maneuvered through the turn earlier that morning: by steering through it (using ahead-speed on the engines) or by "flanking." The flanking maneuver allows tows to pivot around the point of a bend, similar to how a large log might drift downriver.

Figure 5. Aerial view of Kempe Bend on the Mississippi River, near the town of Waterproof, Louisiana, and about 25 miles north of Natchez, Mississippi. (Image by Google Earth)

In a flanking maneuver, the operator reverses the engines so that the forward speed of the tow is reduced, and places the stern of the tow toward the inside, or "point," of the bend. During the turn, the operator applies a series of engine thrusts against the current to keep the stern near the point of the bend, while the current swings the head of the tow around the outside of the bend (figure 6). A vessel operator may decide to flank around a bend if the combined forward speed of the vessel and the current might otherwise push the tow onto the outside riverbank before the turn can be completed. Compared with steering around a bend, flanking requires more time to navigate through relatively short stretches of the river (as the forward speed is slower) but reduces the risk of running aground. Flanking is possible only when the current pushes the vessel from astern and "carries" the vessel through the turn. As the *Riley Elizabeth* approached Kempe Bend, the river current was pushing the tow from astern at a speed of about 5 mph.

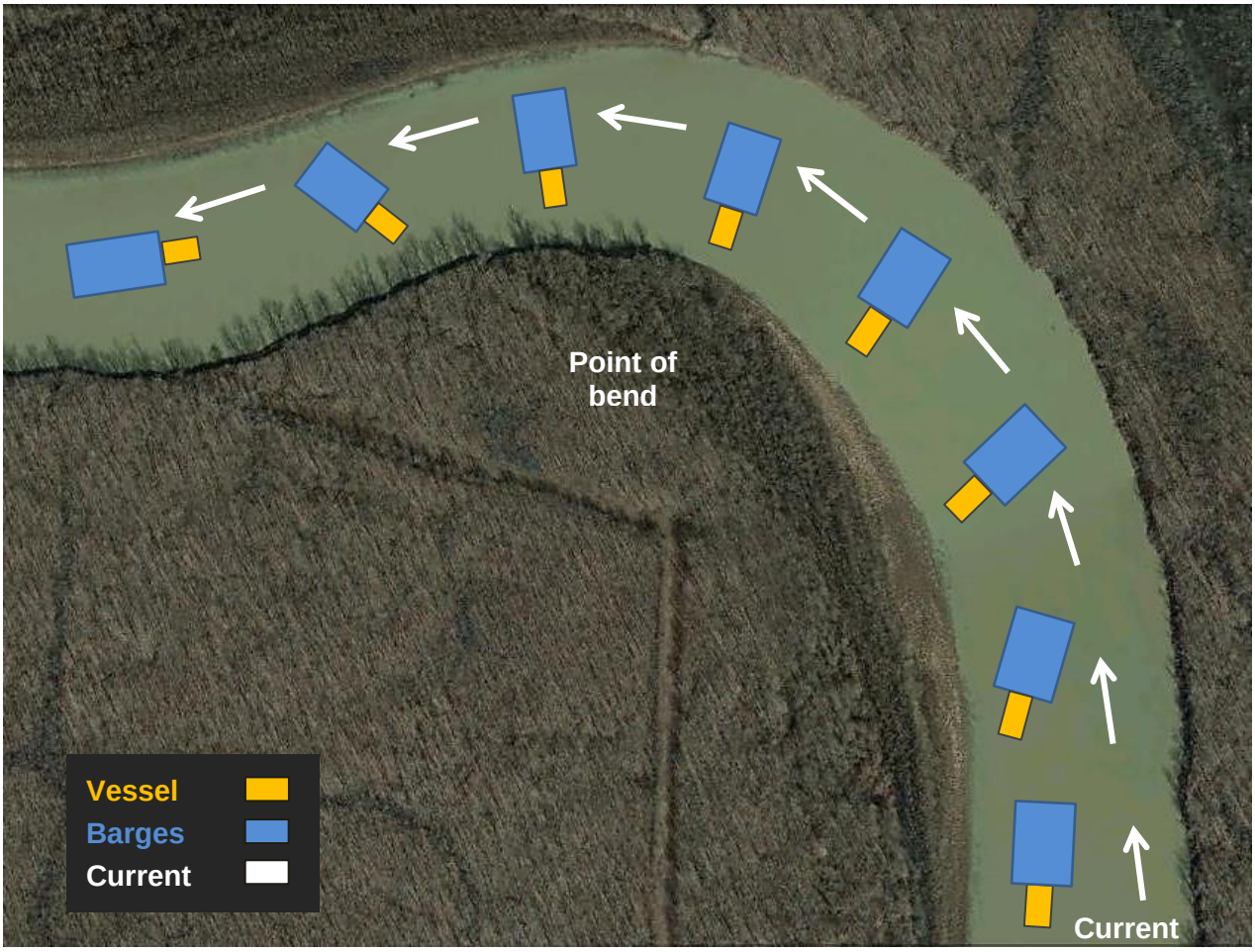

Figure 6. Aerial image with overlaid symbols, representing a flanking maneuver in a waterway unrelated to this accident. (Background by Google Earth)

The mate radioed other vessel traffic in the area. The operator on the *Harrison*, a towing vessel owned and operated by the US Army Corps of Engineers (Corps of Engineers) and positioned about 5 miles downriver, responded. The *Harrison* and the Corps of Engineers towing vessel *William James* were serving as contact vessels for a Corps of Engineers revetment project (mat-sinking) at Kempe Bend to stabilize the riverbanks.[3] The project, which had been at that location for about 1 week, used 10 barges and 1 vessel (described in the table below). Five of the barges were spar barges, used for anchoring other barges. The spar barges were positioned end to end perpendicular to the riverbank and extending about 600 feet into the waterway from the outer, or west, side of Kempe Bend (figures 7 and 8). The distance from the riverbank to the sand bar at the point of Kempe Bend was about 1,750 feet; the spar barges extended about one-third of that distance.

[3] The revetment project, conducted by the Corps of Engineers in Vicksburg, Mississippi, involved mat-sinking: wiring together concrete mattresses, each about 25 feet long and 4 feet wide, and placing them on the riverbanks, starting above the highest water level on the bank and extending below the surface of the river to the submerged toe of the bank.

Corps of Engineers Revetment Project at Kempe Bend:

• Five spar barges	Each 120 ft long and 30 ft wide, arranged end to end perpendicular to the shoreline and extending about 600 ft from the bank into the river. (Nos. *9001, 9002, 9003, 9004*, and *7312*)
• One mooring barge	400 ft long and 45 ft wide; tied alongside the spar barges, perpendicular to the riverbank. (No. *7403*)
• One mat boat (barge)	176 ft long and 75 ft wide, positioned parallel to the riverbank; provided a platform for forming and laying sections of mat. (No. *4801*)
• Two mat barges	Each 160 ft long and 34 ft wide; transported mats from the mat manufacturing site to the work site. Tied to the riverside of the mat boat while at Kempe Bend. (Nos. *7506* and *8904*)
• One towing vessel	The *Mary Wepfer*, 56 ft long and 24 ft wide, under contract with the Corps of Engineers; towed loaded and empty mat barges between the staging area (2 miles downriver) and the work site, and positioned the mat barges and equipment for installation. Configured astern of the two mat barges.
• One upper set barge	300 ft long and 30 ft wide. Anchored to shore; stabilized the five spar barges via cables. (No. *8906*)

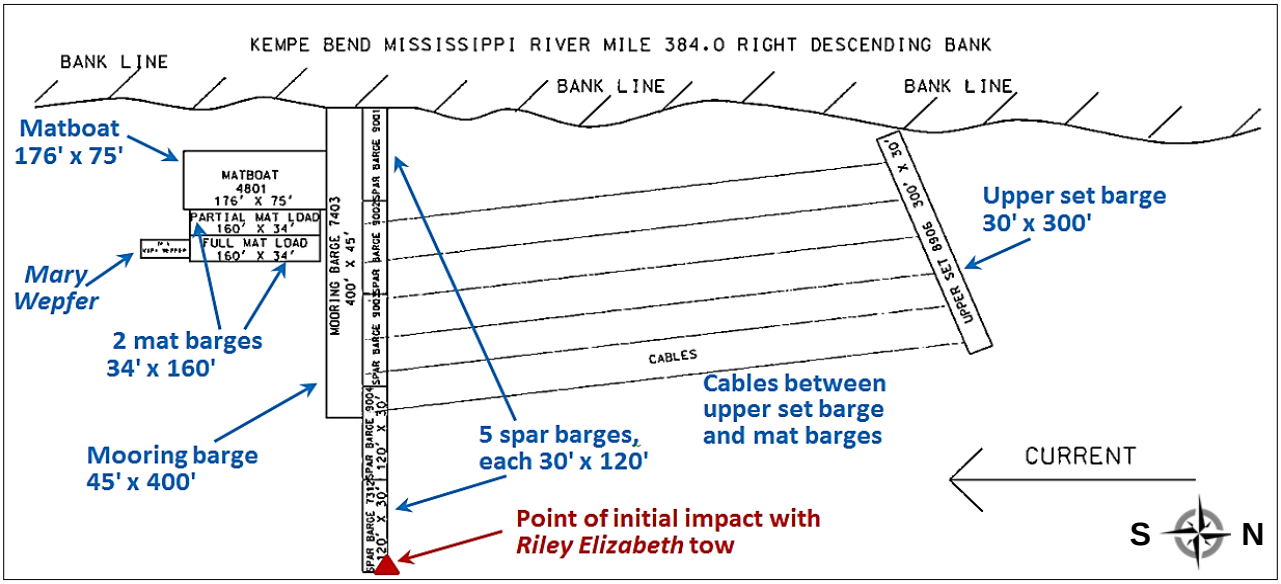

Figure 7. Excerpt from a Corps of Engineers drawing, created after the accident, depicting the layout of the barge plant as if seen from above. (Image provided by the Corps of Engineers) Also see figures 8 and 9.

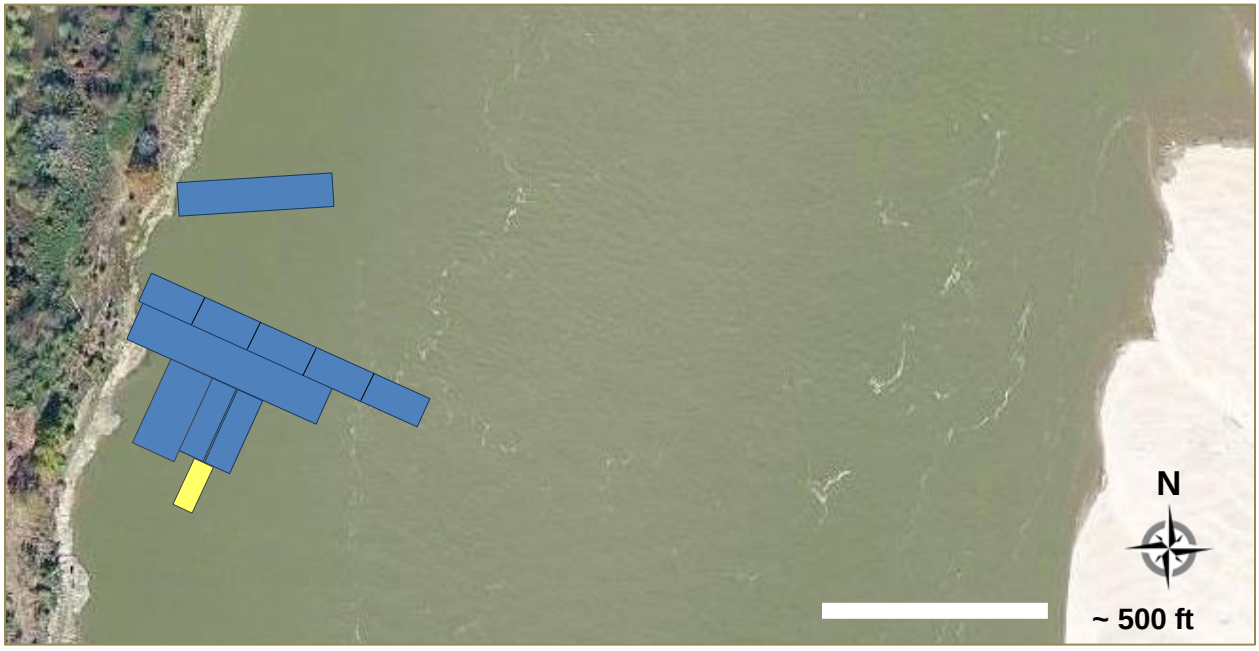

Figure 8. Aerial view of a section of Kempe Bend. Overlaid symbols (not to scale) represent the 10 barges (blue) and 1 vessel (yellow) involved in the Corps of Engineers mat-sinking project. (Background by Bing Maps)

Figure 9. Arrangement of barges in another Corps of Engineers revetment operation (unspecified location and date). Three spar barges are pictured in this photo; at the time of the accident, five spar barges were arranged end to end. (Corps of Engineers file photo)

At the time, the barge plant had suspended operations for the night, but the barges remained in working position. The operators on board the *Harrison* and the *William James* (positioned about 2 miles downriver from the barge plant) were making arrangements for vessels that needed to transit past the work site.

The *Harrison* operator told investigators that he radioed the *Riley Elizabeth* after he heard the mate talking to northbound traffic when the tow was "3 or 4 miles up the river" (about 30 minutes before the collision) to tell him where the barge plant was located. He said that the mate asked what other vessels "had been doing to make the bend," and the *Harrison* operator replied "slow-steering it" (proceeding at slow-ahead speed, not flanking the turn).

The *Riley Elizabeth* mate told investigators that he proceeded at slow-ahead speed, as the *Harrison* operator said that other tows had done. The ECS data showed that the *Riley Elizabeth* held close to the left, or inside (point), bank of the river as the turn around Kempe Bend began. As the mate steered around the inside of Kempe Bend, the tow began drifting across the river, moving toward the outside bank of the river. The ECS recorded the speed over ground during the turn as 7.48 to 7.71 mph (figure 10). At mile marker 384, 0.19 miles from the *Mary Wepfer* in the barge plant, the tow was along the outside of the bend. The ECS lateral slide indicator showed the speed of the *Riley Elizabeth* sideways movement as 8.4 mph at the stern and 6.4 mph at the head of the tow.

Figure 10. ECS screen shot from the time leading up to the collision. The *Riley Elizabeth* appears as a yellow triangle with a yellow line indicating its trackline (note that the tow extends 1,000 feet in front of the towing vessel itself; only the vessel appears in this image). Towing vessel *Mary Wepfer*, which was part of the Corps of Engineers barge plant, appears as the light pink triangle to the left of the *Riley Elizabeth*, closest to the riverbank. The two dark pink triangles in this image are buoys. (ECS recording from on board the *William James*) The blue and teal colors indicate water.

The Corps of Engineers barges were not electronically marked in any automatic identification system (AIS), and were therefore not visible on the *Riley Elizabeth* ECS.[4] The mate told investigators that, based on his assessment of the radar before committing to slow-steering around Kempe Bend, he did not perceive any barges extending into the river. The tow was about 2.5 miles upriver from the barge plant at that point. Moreover, the *Riley Elizabeth* mate expected the Corps of Engineers barge plant to be "folded for the night"; that is, moored alongside the riverbank and not extending perpendicularly into the river.

The mate further told investigators that, as he maneuvered through Kempe Bend, he saw what he thought was a red-lighted buoy ahead. He radioed the *Harrison* to ask if there was "a red buoy close to the mat unit." The *Harrison* operator replied, "another boat could have dragged [a buoy] out, but I had been up there at eleven o'clock and everything looked fine." The *Harrison* operator told investigators that shortly thereafter, he heard the mate say, "That's not a buoy, that's a light," on realizing that the light ahead was a barge light. The *Riley Elizabeth* was about one-half mile from the outermost spar barge at that point. The mate told investigators he did not see the spar barges that extended 200 feet beyond the deck lights of the mooring barge. According to what he could see on radar, the barges "were sticking out just a little bit." The mate told investigators he brought the engine throttles to full ahead to increase the rate of turn to get through the bend before the current set the tow toward the riverbank and the barge plant. Beginning about 0353 and for the next 2 minutes, the vessel speed increased by almost 1 mph (from 7.71 mph to 8.63 mph) and the vessel was turning at a rate of up to 30 degrees per minute to port. However, these efforts were not enough to avoid the barge plant. At 0355:08, the *Riley Elizabeth* tow collided with the barge plant.

The initial contact occurred as the *Riley Elizabeth* tow slid laterally across the river at Kempe Bend.[5] The second barge from the head of the tow on the starboard side struck the upriver corner of the outermost spar barge. The force of the impact broke a barge coupling, allowing the two outermost spar barges to float downstream. As the *Riley Elizabeth* tow continued to slide through the turn, its aftmost barge and the starboard side of the *Riley Elizabeth* struck the upriver corner of the mooring barge, which had previously been shielded by the two breakaway spar barges.

In addition, a cable broke between the mooring barge and the upper set barge, and other winch brakes slipped, which allowed several of the Corps of Engineers barges to pivot downstream until the mat boat and the *Mary Wepfer* struck the riverbank.

After impact, the *Riley Elizabeth* tow pushed into the riverbank about 3 miles downstream. The *Harrison* and the *William James* departed their positions to look for the breakaway spar barges and tend to the barge plant. The *Mary Wepfer*, which was initially pinned against the riverbank after the collision, also eventually assisted in the recovery work.

[4] AIS is a maritime navigation safety communications system. At 2- to 12-second intervals on a moving vessel, AIS automatically transmits vessel information, including vessel name, type, position, course, speed, navigational status, and other safety-related information, to appropriately equipped shore stations, other vessels, and aircraft. The rate at which the AIS information is updated depends on vessel speed and whether the vessel is changing course. AIS also automatically receives information from similarly equipped vessels.

[5] This information was based on damage assessments of the *Riley Elizabeth*, two of its barges, and the Corps of Engineers barge plant.

1.1 Damage

1.1.1 *Riley Elizabeth* Tow

Damage to the *Riley Elizabeth* tow included shell plate punctures and insets to two barges on the starboard side of the tow—the second barge from the head of the tow and the aftmost barge (figures 11 and 12). The *Riley Elizabeth* hull was punctured and inset near the stern on the starboard side. Neither the vessel nor the barges took on water. Damage to the *Riley Elizabeth* and the two barges was estimated at $100,000.

Figure 11. Damage to the starboard side of the aftmost barge in the *Riley Elizabeth* tow. (Photo by the Coast Guard)

Figure 12. Damage to the starboard side of the second barge from the head of the *Riley Elizabeth* tow. (Photo by the US Coast Guard)

1.1.2 Corps of Engineers Barge Plant

The coupling between the two outermost spar barges broke, causing these barges (nos. *9004* and *7312*) to drift downriver and sustain damage (figure 13).

Figure 13. Damage to the inshore end of spar barge *9004*. The Corps of Engineers towing vessel *William James* is in the background. (Photo by the Corps of Engineers)

In addition, the mooring barge sustained damage to its outer upriver corner and to its main deck overhead. Damage to the *Mary Wepfer* included two bent flukes on the port propeller, a bent port main steering rudder, and two (of four) bent flanking rudders.

The two mat barges broke away from the mat boat and collided with the mooring barge. The two outermost spar barges were still connected by cables to the mooring barge, and they came to rest against one of the mat barges. Damage to the barge plant totaled about $200,000.

1.2 Personnel Information

Mate. The mate, age 63, first obtained a towing vessel license in 1971. He told investigators that he began piloting tows with 16 barges in 1974 and routinely operated tows with up to 40 barges. He had previously operated tows through Kempe Bend.

The mate had arrived on board the *Riley Elizabeth* on the morning of July 17, 2014, the day before the accident, while the vessel passed through Greenville, Mississippi. The mate told investigators that while at home, he slept 12.5 hours between 2000 on July 15 and 0830 on July 16. That evening, he began driving to Greenville at 2200, arrived at 0500, and slept for 2 hours in a motel before joining the *Riley Elizabeth* at 0900 on July 17. He then slept for another

2 hours before beginning his first 6-hour watch at noon on July 17. After the watch, he slept from 1800 to 2300. At midnight on July 18, the mate relieved the captain and began his second 6-hour watch (the accident watch) after the captain finished flanking the tow around a bend and began steering a straight course.

1.3 Vessel Information

The *Riley Elizabeth* is owned by Strait Maritime Group and operated by Western Rivers Boat Management of Paducah, Kentucky, which operates 27 towing vessels, mostly on inland rivers. (Also see Appendix C.)

1.4 Weather and Waterway Information

According to weather data from Natchez-Adams County Airport, Mississippi, located about 20 miles south-southeast of Kempe Bend, visibility was 9 miles on the night of the accident and winds were from the northwest at 7 to 8 mph. The mate told investigators that rain fell during his watch, including during the turn through Kempe Bend, and that it rained heavily after he pulled alongside the bank after the collision.

Transiting downbound on the Mississippi River, Kempe Bend is a 90-degree turn to port from west to south. In the accident area, the Corps of Engineers maintains the Mississippi River navigation channel at 9 feet deep and 300 feet wide at low water. No piers or wharfs are in this rural section of the river.

At the time of the accident, based on recordings taken in Natchez, the river stage was 35 feet above low water as measured from the reference point, or "gage zero." The Corps of Engineers uses 17.28 feet as the gage zero (low water) elevation in Natchez. The distance across the river from the riverbank at the Corps of Engineers barge plant to the sand bar at the point of Kempe Bend was about 1,750 feet. The river current was about 5 mph.

2. Investigation and Analysis

This investigation included postaccident examination of vessel machinery, propulsion and steering systems, and bridge equipment. No anomalies were noted. Investigators also reviewed meteorological information, health and toxicological records, and any use of personal electronic devices leading up to the accident, and found no issues in these areas. Investigators learned during the course of the investigation that the lighting of the Corps of Engineers barge plant did not comply with navigation rules; however, this shortcoming did not likely contribute to the accident.[6] The barge plant did have lighting, including on the outermost point of the spar barge that extended farthest into the waterway.[7] Moreover, by the time the mate would have visually sighted the lighting—even had it complied with regulations; that is, 1 mile away—he would already have committed to slow-steering through the bend (which he did when the tow was about 2.5 miles away from the barge plant). At that point—1 mile away or less—he would not likely have had enough time to avoid the collision without running the tow aground. As of the date of this report, the Corps of Engineers, working with the Coast Guard, was in the process of installing regulation-compliant lighting on its barges. The NTSB concludes that mechanical issues, weather, medical conditions and medications, use of alcohol and illegal drugs, distraction from personal electronic devices, and barge lighting were not factors in this accident.

2.1 Incomplete Information about Corps of Engineers Barge Plant

Although the main purpose for positioning the *Harrison* and the *William James* as contact vessels near the barge plant was to facilitate transits past the plant, the *Harrison* operator did not inform the *Riley Elizabeth* mate that the barge plant extended 600 feet into the waterway. In addition, during their radio conversation, the *Harrison* operator relayed that other tows had "slow-steered" through Kempe Bend that night. However, slow-steering a large tow such as the *Riley Elizabeth* with a 5-mph following current increased the risk of the tow moving laterally across the river and toward the barge plant.

Investigators learned during the course of the investigation that the Corps of Engineers had no checklist or guidance regarding what information its contact vessel operators should convey to mariners. After the accident, a Corps of Engineers Vicksburg District investigation report, dated July 23, 2014, stated in part, "The indirect cause of the accident was our pilot's failure to tell the commercial pilot how far from the riverbank our barges extended." The report further stated, "Our pilots will be instructed to always tell commercial pilots how far out from the river bank our plant extends." The Corps of Engineers revetment chief said that this instruction began 3 days after the accident.

[6] Inland Navigation Rule 30 requires every barge "not moored parallel to the bank or a dock" to "carry two unobstructed all-around white lights of an intensity to be visible for at least one nautical mile" (Title 33 *Code of Federal Regulations* [*CFR*] 83.30[h][iv] and [i]). Rule 30 requires that these white lights be displayed on the barge's outboard corners (Title 33 *CFR* 83.30[j][i]). In addition, Inland Navigation Rule 27(d) (Title 33 *CFR* 83.27[d]) requires a vessel engaged in dredging or underwater operations and restricted in the ability to maneuver to exhibit "three all-around lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white."

[7] At the time of the accident, the barge plant was using clamp-on metal lamps with standard light bulbs, similar to lights hooked to an automobile when doing maintenance.

In addition, although the Corps of Engineers informed the Coast Guard of the revetment project ahead of time, and although the Eighth Coast Guard District issued a local notice to mariners on July 16, 2014, the information in the notice did not indicate how far into the waterway the project extended.[8] The information in the notice stated the following:

> MILE 385.0 – MILE 381.5 REVETMENT OPERATION
>
> Continuing until further notice, revetment operations will be conducted between approximate mile 385.0 and 381.5 . . . The M/V *Harrison* and the M/V *William James* will be the contact vessels on scene. Mariners are urged to transit the area at their slowest safe speed to minimize their wake and proceed with caution, after passing arrangements have been made.

After the accident, a local notice to mariners about a similar Corps of Engineers revetment project was more specific and stated that the barge plant would extend 700 feet into the waterway.

Because neither the *Harrison* operator nor the local notice to mariners disclosed how far into the river the Corps of Engineers project extended, the *Riley Elizabeth* mate remained unaware of the extent of the obstruction as he approached the barge plant. The NTSB therefore concludes that the information provided by the designated Corps of Engineers contact vessels and the Coast Guard-issued local notice to mariners did not adequately warn of the waterway obstruction posed by the barge plant. The NTSB therefore recommends that the Corps of Engineers specify in the information it provides to the public how far Corps of Engineers projects extend into the waterway.

Although the information provided by the Corps of Engineers contact vessels was incomplete, the *Riley Elizabeth* mate could have asked the contact vessels for more detail about the position of the barge plant. Instead, he relied simply on his previous experience with revetment projects and assumed that the barges would be positioned closer to the riverbank for the night. However, Navigation Rule 7, which addresses risk of collision, states that mariners should not make assumptions based on scanty information.[9] The NTSB concludes that the *Riley Elizabeth* mate should have determined the extent of the waterway obstruction posed by the Corps of Engineers barge plant before starting the turn at Kempe Bend, especially given the large size of the *Riley Elizabeth* tow and the 5-mph current pushing the tow from astern.

2.2 Need for Expanded Use of Automatic Identification Systems

Coast Guard requirements for vessels to carry AIS did not apply to the barges in the Corps of Engineers revetment project.

As described in a Coast Guard proposed rulemaking published in 2008, AIS automatically broadcasts dynamic, static, and voyage-related vessel information. The Coast Guard also stated the following:

> In ship-to-ship mode, AIS provides essential information to other vessels, such as name, position, course, and speed, that is not readily available on board vessels. . . . AIS

[8] Each Coast Guard district disseminates an electronic weekly local notice to mariners to convey safety information, such as hazards, channel depths and conditions, changes to aids to navigation, and corrective information for charts and publications. Each district commander has broad discretion in determining the content of the safety information in local notices to mariners.

[9] Inland Navigation Rules Act of 1980 (Public Law 96–591, 94 Stat. 3415, Title 33 *United States Code* 2001–2038).

> enhances the mariner's situational awareness, makes possible the accurate exchange of navigational information, mitigates the risk of collision through reliable passing arrangements, facilitates vessel traffic management while simultaneously reducing voice radiotelephone transmissions, and enhances maritime domain awareness.

The AIS information received on board other vessels can include onscreen, scaled diagrams of vessels based on the overall length and width that operators enter into AIS.

The 2008 rulemaking proposed "to require AIS on dredges or floating plants near commercial channels because these vessels—given the nature of their operation—pose a unique challenge to navigation." However, in its final rule, published in January 2015 and effective in March 2015, the Coast Guard limited AIS carriage requirements to self-propelled vessels and excluded "floating plants" such as the Corps of Engineers revetment operation.[10]

Although the final rule limited the types of vessels required to carry AIS, the Coast Guard expressed the following concern about vessels operating without AIS[11]:

> Under 33 [*United States Code*] *USC* 1223(b)(3) and 33 *CFR* 160.111, a Coast Guard captain of the port (COTP) may restrict the operation of a vessel if he or she determines that by reason of weather, visibility, sea conditions, port congestion, other hazardous circumstances, or the condition of such vessel, the restriction is justified in the interest of safety. In certain circumstances, if a COTP is concerned that the operation of a vessel not subject to §164.46 would be unsafe, the COTP may determine that voluntary installation of AIS by the operator would mitigate that concern.

This guidance is consistent with the Coast Guard declaration in the preamble to the final rule, which states the following: "We encourage all commercial vessels to equip themselves with AIS." Specifically, for floating plants without AIS, the Coast Guard also noted that AIS aids to navigation installed on fixed structures near work areas may enhance safety.

Because the Coast Guard recognized the benefits of AIS aids to navigation, the AIS final rule made the AIS aids to navigation option available to mariners. Options available to revetment projects include portraying their location on AIS-capable displays using virtual buoys, or an AIS application-specific message.

If the Corps of Engineers barge plant at Kempe Bend had used AIS aids to navigation, the *Riley Elizabeth* mate could have seen on the vessel's ECS that the spar barges extended 600 feet from the riverbank.

With the publication of the note in the AIS requirements, the Coast Guard will now assess the location of each revetment project and may issue COTP orders to restrict revetment operations. These actions could help compensate for the absence of AIS safeguards (such as marking Corps of Engineers barges with AIS aids to navigation, or entering an application-specific message about revetment projects into AIS). Nevertheless, the NTSB concludes that using AIS to mark Corps of Engineers barges would significantly reduce

[10] If the AIS carriage requirements did apply to non-self-propelled vessels, the requirements would not have applied to the barge plant because the Corps of Engineers owns those barges. In the applicability section of the AIS requirements, the regulations state that the AIS requirements do not apply to vessels owned by the US government and used only in government noncommercial service when the vessels are equipped with electronic navigation systems that have met their agency regulations regarding navigation safety (Title 33 *CFR* 164.01[c]).

[11] This information appeared in a supplemental note to Title 33 *CFR* 164.46(b).

waterway hazards. The NTSB therefore recommends that the Corps of Engineers use AIS aids to navigation or application-specific messages to mark potential hazards to navigation.

3. Conclusions

3.1 Findings

1. Mechanical issues, weather, medical conditions and medications, use of alcohol and illegal drugs, distraction from personal electronic devices, and barge lighting were not factors in this accident.

2. The information provided by the designated US Army Corps of Engineers contact vessels and the US Coast Guard-issued local notice to mariners did not adequately warn of the waterway obstruction posed by the barge plant.

3. The *Riley Elizabeth* mate should have determined the extent of the waterway obstruction posed by the US Army Corps of Engineers barge plant before starting the turn at Kempe Bend, especially given the large size of the *Riley Elizabeth* tow and the 5-mph current pushing the tow from astern.

4. Using the automatic identification system to mark US Army Corps of Engineers barges would significantly reduce waterway hazards.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the collision of the *Riley Elizabeth* tow with the US Army Corps of Engineers barge plant was the incomplete information provided by the Corps of Engineers about the extent of the obstruction in the waterway, and the failure of the *Riley Elizabeth* mate to determine the extent of the obstruction before starting the turn at Kempe Bend.

4. Recommendations

As a result of its investigation, the National Transportation Safety Board makes the following safety recommendations to the US Army Corps of Engineers:

Specify in the information you provide to the public how far US Army Corps of Engineers projects extend into the waterway. (M-15-13)

Use automatic identification system aids to navigation or application-specific messages to mark potential hazards to navigation. (M-15-14)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

CHRISTOPHER A. HART
Chairman

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Member

T. BELLA DINH-ZARR
Vice Chairman

EARL F. WEENER
Member

Adopted: December 16, 2015

Appendixes

Appendix A – Investigation Information

The National Transportation Safety Board launched an investigator from the Office of Marine Safety on July 19, 2014, the day after the collision, and he remained on scene for 2 days. He met with the parties to the investigation in Natchez, Mississippi, and then proceeded to Waterproof, where he examined the damaged barges and learned how the Corps of Engineers operates and manages revetment projects. He also interviewed the *Riley Elizabeth* captain and the mate on board the vessel near St. Francisville, Louisiana.

Appendix B – Information about Revetment Projects

The following information about a Corps of Engineers revetment project was obtained from the Corps of Engineers' Vicksburg district website (accessed November 9, 2015).
www.mvk.usace.army.mil/Missions/OperationsDivision/RiverOperations/MatSinkingunit.aspx

WHAT
The four gantry cranes move the 16-block sections of mat from the supply barge across to the mat boat where workers, using a pneumatic "mat-tying" tool, wire the sections together and to 3/8-inch launching cables running lengthwise between sections.

Normally, the 4- by 25-foot sections are tied together to make a square (100 square feet), and 35 squares go together to form a launch. Each supply barge holds 585 squares of mat, consisting of 950 tons of concrete.

The crew hooks the mat cables to dozers (tractors) waiting on shore and the work barge inches away from shore, along the mooring barge, which is 400 by 45 feet, or 100 feet longer than a football field, to launch the concrete "carpet," thus covering 300 to 600 feet of the long sloping riverbanks. The entire plant moves upstream 130 feet and begins the first launch of a new channel mat.

HOW
The crew and mat boat are in place when the mooring barge is perpendicular to the shore and the mat boat is parallel to the shore and secured to the mooring barge. The articulated concrete mattress arrives on location by barge from one of the mat casting fields along the river in Tennessee, Mississippi, and Louisiana.

A fleet of 46 mat supply barges, part loaded and on location and part empty and waiting to be loaded by the mat loading crew at the casting field, is towed up and down the river by Corps or contract boats. On the location, a mat supply barge is moored to the mat boat and the mat laying operation begins.

WHY
The mat forms a protective overcoat to shield the riverbank from erosion and sloughing caused by channel currents and turbulent water associated with river flood stages.

Appendix C – Vessel Information

Vessel	***Riley Elizabeth***
Owner/operator	Strait Maritime Group/ Western Rivers Boat Management, Inc.
Port of registry	Paducah, Kentucky
Flag	United States
Type	Towing vessel
Year built	1975
Official number (US)	564321
Construction	Welded
Length	128 ft (39 m)
Draft	9.5 ft (2.9 m)
Beam/width	42 ft (12.8 m)
Tonnage	514 gross registered tons
Engine power	5,600 hp (4,176 kW)
Propulsion	Diesel reduction
Persons on board	7